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ABSTRACT

This research hypothesized that preformal-operational children (before age 11) can improve their ability to write persuasive essays at an age earlier than Jean Piaget's developmental stage model would predict. A Vygotskian social interactionist approach, which claims that adult intervention can help children achieve what may have seemed beyond their abilities, was used. Fourth and sixth graders (n=153) wrote two persuasive essays, with 3 weeks of instruction intervening for the experimental group. Instruction consisted of daily 45-minute lessons for 3 weeks, involving brainstorming, supporting, conferencing, and editing on different topics. The essays were evaluated on the basis of "claims," "data," and "warrants." Students in the experimental group on the whole performed better than those in the comparison group. Girls performed better across all three aspects than did boys. Of the three measures, "warrants" seemed to be the most difficult. The experimental treatment was questionable for boys on this trait, as performance of fourth grade comparison group boys was higher than that of experimental group boys. The study concludes that formal operations are not a necessary precondition for writing persuasive essays; a Vygotskian approach to the teaching of writing is supported; girls acquire formal operations sooner than boys; and girls have superior verbal abilities that allow them to perform generally better than boys at writing tasks. (Contains 19 references.) (JDD)

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APPLYING VYGOTSKY: TEACHING PREFORMAL-OPERATIONAL CHILDREN A FORMAL-OPERATIONAL TASK

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ABSTRACT

This research hypothesized that preformal-operational children (before age 11) can improve their ability to write persuasive essays at an age earlier than Piaget's developmental stage model would predict. Fourth and 6th graders (N=153) wrote two persuasive essays with three weeks of instruction intervening for the experimental group. Girls scored significantly higher on *claims*, *data*, and *warrants* (Toulmin, 1958). Fourth-grade experimental boys scored below 4th-grade comparison boys on *warrants*, suggesting that *warrants* may be particularly difficult for that age and sex. A Vygotskian social interactionist approach, claiming that adult intervention can help children achieve what may have previously seemed beyond their abilities, is discussed for teaching this genre at a younger age than currently targeted.

APPLYING VYGOTSKY: TEACHING PREFORMAL-OPERATIONAL CHILDREN A FORMAL-OPERATIONAL TASK INTRODUCTION

Despite today's literacy crisis, schools typically put off until 11th grade the teaching of persuasive writing, a genre often used to measure academic achievement. Even college composition courses regard it as the culminating activity at the end of the course (McCann, 1989). Judging by its total absence in most elementary school writing curricula, this genre is thought by curriculum designers to be way beyond the cognitive abilities of that level of student. While it is true that persuasive writing is among one of the more difficult genres, the notion that elementary school children are not cognitively ready to practice or improve their ability to write in it has not been empirically tested.

This article tests the hypothesis that young children can, with adult intervention, improve their ability to write persuasive essays at an age earlier than predicted by Piaget's developmental model, which is frequently offered as the theoretical underpinning for elementary school curriculum design.

TWO OPPOSING THEORIES ABOUT CHILDREN'S COGNITIVE DEVELOPMENT

Vygotsky's *Zone of Proximal Development*

Even though Vygotsky hypothesized that concept formation does not occur until puberty, he did not eschew the notion of teaching persuasive writing, which involves analysis of problems, before puberty. On the contrary, he stated (1978) that children should be given ample opportunities to read and write in all genres. To understand why Vygotsky advocated exposure to concepts that were admittedly beyond a child's cognitive abilities, one must also understand Vygotsky's views on learning and development.

Vygotsky's interactionist theory emphasizes the capacity for social and educational influences to affect cognitive development. His theory about the relationship between learning and development in a child, called the zone of proximal development, incorporates this view of social interaction. The zone is defined as

> the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers (1978, p. 86).

Consider, for example, two 7-year-olds who achieve the same score on a particular cognitive task that is beyond their ability to accomplish by themselves. From a Piagetian perspective, the abilities of these children are said to be nearly cognitively equivalent. However, let us say that they also receive instruction from an adult, and when retested, they show different levels of achievement. According to Vygotsky, these different levels could only be due to their respective learning potentials given the instruction of an adult, or what he calls the zone of proximal development. Without this instruction in a task beyond their ability to achieve by themselves, the children would be seen as nearly equivalent. However, according to Vygotsky, these different zones of proximal development will manifest themselves in the future as actual developmental differences, that is, as cognitive differences without the assistance of an adult. When the two children are tested without adult intervention, for example, one year later, the child who benefitted more from instruction will demonstrate higher achievement than the other. In this sense, early learning dramatically affects later development. The difference between the two children would, according to

Vygotsky, be even more dramatic if one of them did not receive any instruction at all. Such changes in ability level have been documented by Vygotsky (1978) and Rogoff and Wertsch (1984).

Vygotsky further claimed that learning always precedes development; in other words, early learning that is not manifested in actual behavior today will mature tomorrow developmentally. He asserted that learning is not mere maturation, but that "properly organized learning results in mental development and sets in motion a variety of developmental processes that would be impossible apart from learning" (Vygotsky, 1978, pp. 86, 90). In science, for instance, a second grader may not fully understand all that is involved in watching a buoyancy experiment, but that rudimentary knowledge can accelerate learning when the experiment is repeated in subsequent grades. It would seem to follow from Vygotsky's research that the sooner the seeds of these cognitive processes are planted, the sooner they can begin to grow and attain fruition. Restated in the framework of this paper, then, if children are given the opportunity to read and write persuasive essays, they may very well "achieve cognitively what had seemed beyond them when measured by experimental tests" (Freedman and Pringle, 1984, p. 81).

Piaget's Theory of Cognitive Development

Quite the opposite from Vygotsky, Jean Piaget saw cognitive processes as unfolding maturationally over time. Moreover, he posited that unless children have the requisite cognitive structures to assimilate new experiences, no genuine learning will occur. If the cognitive structures are absent, the learning will be superficial, temporary, unstable, and not easily generalized. Consequently, Piaget deemed it pointless to introduce certain concepts

before cognitive structures are ready to assimilate and equilibrate the information (Inhelder and Piaget, 1964).

Piaget's theory has had enormous implications for the teaching of writing. For instance, James Moffett's influential book, *Teaching the Universe of Discourse* (1968), advocates a structural approach to the teaching of writing built on a Piagetian framework. He suggested teaching genres in the order of their level of abstraction. Thus, drama, for instance, would be taught first since it is merely recording events. Narrative, which reports events, follows drama. Exposition is next, since it entails the generalizing of events. Logical argumentation, which requires theorizing, comes last. Moffett concluded that after mastery of recording, students should be taught to report, generalize, and theorize, in that order.

However, more recent research has cast doubt on the belief that stages develop in an orderly, invariant sequence. It has been shown, for example, that normally nonconserving 5-year-olds can become conservers with startlingly little training (Gelman, 1969). (A conserver knows that the volume of liquid remains constant regardless of container size.) As Gelman and Baillargeon (1983) reported, "It is now clear that preschoolers benefit from training designed to alter their typical classification solutions" (p. 178), an ability previously not thought to be possible before age 7. The fact that training can be shown to alter structures is just as Vygotsky predicts in his zone theory: Cognitive abilities are *fostered* and *accelerated* by learning, not subordinate to it.

Formal Operations -- What Are They?

The notion of formal reasoning, or formal operations, was best articulated by Jean Piaget. In his stage theory, he divided children's cognitive development into four stages:

sensorimotor, pre-operational, concrete operations, and formal operations.

The third stage, concrete operations, from ages 7 to 11, is characterized by an increase in organized thinking on a symbolic plane. Scientific reasoning increases, as shown by Piaget's experiments with conservation of quantity, number, substance, weight, volume, and length. Children can report the implications of reversing a process without having to actually witness the procedure.

It is the fourth and final stage of cognitive development that characterizes formal reasoning, i.e., the ability to think hypothetically, deductively, and inductively. Formal operations, beginning no sooner than age 11 and continuing through adulthood, enable the child to deal with abstract, hypothetical situations. As an example of the differing abilities inherent in each stage, if a child in the concrete stage is asked to compare the heights of several people, he can do so only if the people are lined up in front of him. In formal operational adolescents, the order can be determined with no concrete referent before the child (Piaget, 1964, p. 62).

In one of Piaget's studies, he gave children four flasks of colorless liquid labeled 1, 2, 3, and 4. They also were given another flask labeled "g." They then were asked to mix the liquids to make yellow. Children in the preoperational stage (ages 2 to 7) simply made a mess. Those in the concrete stage approached the task more systematically but failed to go beyond simply adding liquid from "g" into flasks 1, 2, 3, and 4. Their thinking did not go beyond that limited range of possibilities (Crain, 1980). Those in the formal operational stage systematically planned many combinations of the liquids and solved the problem. They also continued testing other combinations even after they had found one that worked.

Formal operations is a set of interrelated abilities that develops over a long period of time and are not merely a stage one moves into automatically during adolescence. According to Piaget (1972), many adults usually attain some level of formal operations by 20 years at the latest but restrict their use to areas of special interest. For instance, the garage mechanic may be able to demonstrate formal operations when trouble-shooting a car, but employ none when given Piagetian tasks involving mathematical and scientific reasoning. Tulkin and Konner (1973) have suggested that preliterate people may also fail to demonstrate formal operations in these Piagetian tasks but do so quite well when working on urgent problems. They cited the Kalahari bushmen in Africa as examples. When discussing animal tracking, they exhibit very sophisticated abilities to advance and weigh hypotheses.

Since formal operations are characterized by the ability to think hypothetically, deductively, and inductively (skills involved in persuasive writing), it follows from Piaget's theory that children cannot learn the skills requisite to persuasive writing before the age of 11. If Piaget is correct in this claim, then schools would be wasting their time trying to teach argumentation in elementary grades. If Vygotsky is correct in his theory that learning precedes development, then it would be theoretically sound to begin instruction well before those structures are in place.

With academic progress and the development of critical thinking skills resting on the acquisition of the important skills of persuasive writing, schools may be doing our elementary students a disservice by restricting their writing models and tasks to narratives about personal topics that seem easier to write. Thus, in addition to writing narratives, students early on in their education should also be studying other genres, such as persuasive writing, which will

be instrumental in later education.

METHOD

Subjects

The 153 participants in this study were drawn from an elementary school in New Hampshire. Forty-one percent of the students were girls (N=62) and 59 percent of them were boys (N=91). Seventy-eight students were in the experimental group, 75 were in the comparison classes. (The control groups are referred to as comparison groups in this study because no attempt was made to control their curriculum, although no training in persuasive writing was given). The gender ratio in both classes was comparable with 30 females and 48 males in the experimental group and 32 females and 43 males in the comparison group.

Although random assignment to treatment groups in research is usually preferred, subjects were not randomly assigned in this study for two reasons: (1) the school year had already started and it would have been very disruptive to change students' accustomed way of learning, and (2) it would have invited the Hawthorne effect for students to know that they were undergoing a special curriculum. None of the students in the experimental classes were told they were being taught a curriculum different from that of the comparison groups.

Design

As a base-line measurement, both the comparison and experimental groups took a pre and posttest around a three-week instructional period. Each test consisted of writing a letter to the principal.

Testing Procedure

Children were not allowed to confer during the testing, although they were allowed to

use dictionaries or ask an adult for help with spelling. This was thought appropriate since neither syntax nor mechanics were graded. None of the usual steps of the writing process, such as conferencing and revising, were used during testing, so the test composition represents a first draft from all students. Students were given the normal class period of 45 minutes to finish the task.

Measurement

Measurement consisted of the grading of *claims*, *data*, and *warrants* on the pre and posttest compositions using an adapted version of Connor's (1990) and McCann's (1989) primary-trait scoring instruments. The primary trait scoring method isolates subcategories of the universe of discourse, and rates writing samples in terms of their aptness within the prescribed range.

The compositions were rated anonymously by three graders. All compositions were graded at the completion of the instruction. The agreement among the raters was quite high; the Cronbach *alpha* coefficients between the graders are presented in Table 1.

TABLE 1. Interrater reliabilities.

Claims

	Grader 2	Grader 3
Grader 1	.89**	.91**
Grader 2		.95**

Data

	Grader 2	Grader 3
Grader 1	.89**	.87**
Grader 2		.91**

Warrants

	Grader 2	Grader 3
Grader 1	.79**	.78**
Grader 2		.83**

The instrument was developed following Toulmin's (1958) model of informal logic that measures *claims, data,* and *warrants.* These are defined as follows:

Claims are "conclusions whose merits we are seeking to establish" (Toulmin, 1958, p. 97) and as "assertions put forward publicly for general acceptance" (Toulmin et al., 1984, p. 29).

Data are interpreted as support for the claim in the form of facts, experience, statistics, or occurrences.

Warrants are construed as amplification or further explanation of the *data* that serve to link the data to the claim.

The researcher necessarily revised these instruments to be more sensitive to differences among younger writers. Connor's and McCann's instruments assumed the presence of *claims, data,* and *warrants* in compositions and measured their sophistication. However, with young children's writing, success is better measured by actual production of those elements. [See author-a for further explanation of the instrument used.]

Instruction

Instruction for the experimental groups consisted of daily 45-minute lessons for three weeks. This design included having children follow the process approach of practicing brainstorming, supporting, conferencing, and editing on different topics. All experimental classes followed the normal process approach for writing tasks. It was therefore not an

additional novelty that students needed to adjust to for the study. The four comparison groups received no instruction in persuasive writing by the teacher. (See author-b for curriculum used.)

RESULTS

Separate ANOVAs were performed to determine whether there were differences in the posttest persuasive essay scores for three dependent variables: *claims*, *data*, and *warrants*. Possible scores for each trait were 0, 2, 4, or 6. The independent variables were gender (male, female), treatment (comparison, experimental), and grade level (4, 6).

Claims

The main effect of gender for *claims* was significant at $p < .03$ ($F = 4.60$, $df = 1$), with girls as a group performing better ($M = 3.90$, $sd = 9.07$) than the boys ($M = 2.43$, $sd = 1.93$). The treatment x gender interaction for *claims* resulted in a trend ($p < .10$, $F = 2.63$, $df = 1$). In the control group, girls ($M = 4.56$, $sd = 12.41$) scored higher overall on the pre and posttests than the boys ($M = 1.98$, $sd = 1.79$). Experimental group girls also scored higher: girls ($M = 3.18$, $sd = 1.89$), boys ($M = 2.82$, $sd = 1.97$). There were no significant differences by grade level.

Data

The interaction between test time x treatment for *data* was significant at $p < .01$ ($F = 2.65$, $df = 1$). The experimental groups in both grades did significantly better on the posttest than the comparison groups.

FIGURE 1 goes here: Test time x treatment for *data* scores.

The main effect of gender for *data* was significant ($p < .03$, $F = 4.72$, $df = 1$). Girls ($M = 3.04$, $sd = 1.53$) scored higher than boys ($M = 2.59$, $sd = 1.56$). The main effect of test time was also significant ($p < .0001$, $F = 15.16$, $df = 1$), with scores on the pretest ($M = 2.48$, $sd = 1.42$) lower than on the posttest ($M = 3.07$, $sd = 1.58$).

Warrants

One three-way interaction for *warrants* was significant: test time x grade x gender ($p < .02$, $F = 4.84$, $df = 1$). The 4th-grade males scored lower on the posttest ($M = .72$, $sd = 1.11$) on *warrants* than on the pretest ($M = .93$, $sd = 1.40$). All other groups scored higher on the posttest.

FIGURE 2 goes here: Test time x grade x gender for *warrants* scores.

Two two-way interactions were significant. The first was treatment x grade ($p < .01$, $F = 5$, $df = 1$). In the fourth grade, the comparison group did better ($M = 1.13$, $sd = 1.54$) than the experimental group 4th graders ($M = .85$, $sd = 1.25$) on *warrants*. Sixth-grade comparison students ($M = .48$, $sd = 1.05$) performed below 6th-grade experimental students ($M = 1.05$), $sd = 1.43$).

FIGURE 3 goes here: Treatment x grade for *warrants* scores.

The other significant two-way interaction for *warrants* was with test time x gender (p .01, $F = 5.92$, $df = 1$), where girls had higher scores on both the pretest ($M = .85$, $sd = 1.41$) and posttest ($M = 1.42$, $sd = 1.56$) compared to boys' pretests ($M = .72$, $sd = 1.32$) and posttests ($M = .69$, $sd = 1.12$).

Two main effects were significant for *warrants* but are uninterpretable because of their involvement in the disordinal three-way interaction.

In general, girls performed better across all three aspects measured on the compositions. Students in the experimental group on the whole performed better than those in the comparison group. Of the three measures, *warrants* seemed to be the most difficult measure for children to master, since scores averaged lower on that trait than any other. The experimental treatment was also questionable for boys on this trait, a conclusion that is supported by the performance of the 4th-grade boys, who scored below the comparison group on the posttest on this measure.

DISCUSSION

The most consistent finding in this study was that, as hypothesized, girls performed better than boys on essay scores for *claims, data,* and *warrants.* With such a strong affirmation of both 4th- and 6th-grade girls' ability to handle this advanced genre, we need to reconsider the appropriateness of the use of Piaget's developmental stage model as a guide when designing writing curricula. His theory states that children younger than age 11 cannot perform tasks employing formal operations. By extension, Piaget would say children younger than 11 cannot handle the rigors of persuasive writing since it calls upon several of the same skills found in formal operations. To resolve this inconsistency between his theory and findings in this study, we can entertain one or more of the following conclusions: (1) Formal operations are not a necessary precondition for writing this genre; (2) girls acquire formal operations sooner than boys; and/or (3) girls have superior verbal abilities that allow them to perform generally better than boys at writing tasks regardless of formal operations.

(1) We know that persuasive writing shares several of the same traits found in formal operational thinking. Since preformal operational (4th-grade) girls did better than boys their same age, the strong conclusion from this finding would be that formal operations are not a necessary precondition for writing this genre and no one of either sex need be formal operational to write persuasively. For if it were a necessary condition, then girls this age would have been unable to produce anything resembling a persuasive essay and certainly would not have profited from training. However, even 4th-grade boys were able to produce acceptable compositions. The girls just performed the task better. Since the design of this study did not aim to answer this question, it seems plausible to accept a weaker hypothesis that the mastery of persuasive writing is *not necessarily restricted* to formal operational children.

(2) The finding that girls as young as nine demonstrate inchoate or nascent abilities to better perform a skill demanding formal operations may lead us to posit that they may acquire formal operations sooner or more quickly than boys. Neither Piaget nor Vygotsky gave any indication that formal operational thinking was acquired sooner by one sex than another. Both reported that children younger than 11 do not usually exhibit the ability to perform tasks involving formal operations. If the sexes are in fact equal in the age at which they acquire formal operations (if matched on other relevant variables), other differences between the genders may help explain the success of female writers in this study.

(3) Generally, girls have been found to have better verbal skills whereas boys excel at math and spatial reasoning. With writing, girls outperform boys in all genres as well as in grammar, punctuation, and spelling (NAEP, 1990).

In reviewing the results, it would seem tenable to posit the weaker conclusion that girls have special abilities or socialization with written communication, either in addition to or in spite of formal operations, and these abilities allow them to perform better at persuasive writing.

The lesson to be gleaned here is that exposure to this genre enables students to improve their mastery of it, regardless of the curriculum or age. As noted earlier, persuasive writing imposes special exigencies on writers that are not found in any other genre. Therefore, no amount of writing in other genres, for example narratives, will help students improve their skill at persuasive compositions since organizational patterns for both are very different and require construction of vastly different schemas. This fact was supported by the performance of the comparison groups, who, without direct exposure to persuasive writing, failed to improve significantly in this genre.

The findings of this study in general support the literature on gender differences in writing and Vygotsky's notion that children's zone of proximal development focuses on what children can accomplish through adult and peer intervention instead of what they cannot do as predicted by Piaget's stage model of development. The results point to several changes educators may consider making in curriculum design for elementary school children that ignore the difficulty of a task and focus instead on how that task can be taught with appropriate adult intervention.

Finally, this study support a Vygotskian approach to the teaching of writing. The fact that children as young as nine of both sexes can improve their performance on persuasive writing lends credence to Vygotsky's zone of proximal development theory, and greatly

detracts from Piaget's stage model. The actual age at which children can perform tasks requiring formal operations is shown by this study to be inconsequential and not applicable to the domain of writing. To say that children are able to perform tasks requiring formal operations only after age 11 is to suggest that stages of development are discrete. However, cognitive abilities develop slowly, and pinpointing their exact time of emergence is nigh onto impossible. Besides, stated Vygotsky, instruction must not be "oriented toward stages that have already been completed" (1956, p. 448). He argued instead that

> instruction is good only when it proceeds ahead of development. It then awakens and rouses to life those functions which are in a stage of maturing, which lie in the zone of proximal development. It is in this way that instruction plays an extremely important role in development (1956, p. 278).

Therefore, the focus of training in this genre and education in general should be on *how much* any one child can progress in refining a particular skill with peer or adult interaction, not on whether a child can meet certain cognitive criteria before instruction begins. Nor should instruction be withheld because of its supposed difficulty. Just because adults perform a particular skill better does not mean younger children cannot begin construction of their own schema for it. Since no one is completely privy to a child's thinking processes, we can only rely on research, such as Vygotsky's, which shows that children vary in abilities but can grow at individual rates when helped by adult and/or peer intervention. It does not make sense to deny children access to persuasive writing, or any skill for that matter. They merely require its presentation be appropriate for their level (Lipman and Sharp, 1978). These findings should help convince educators to use a more

dynamic approach to learning that activates children's potential through adult assistance rather than a more static one that bases curriculum design on what they are not capable of doing.

Vygotsky's theory of the zone of proximal development is indeed antithetical to the usual western view of education where children are tested on what they already know instead of focusing or measuring their achievement after intervention. His approach is very sensitive to the social and interactive nature of language learning and language-based activities, such as writing. But we have much more research to conduct before we have a complete understanding of a child's learning situation. For instance, we need to determine what constellation of other social and biological factors (e.g., cooperative learning situations, verbal abilities, cultural influences) may bear on the success of both girls' and boys' writing, no matter what the genre. Perhaps then we can more properly tailor the instruction to fit individual, genetically determined needs and help curb deficiencies in performance that arise out of improper curriculum design.

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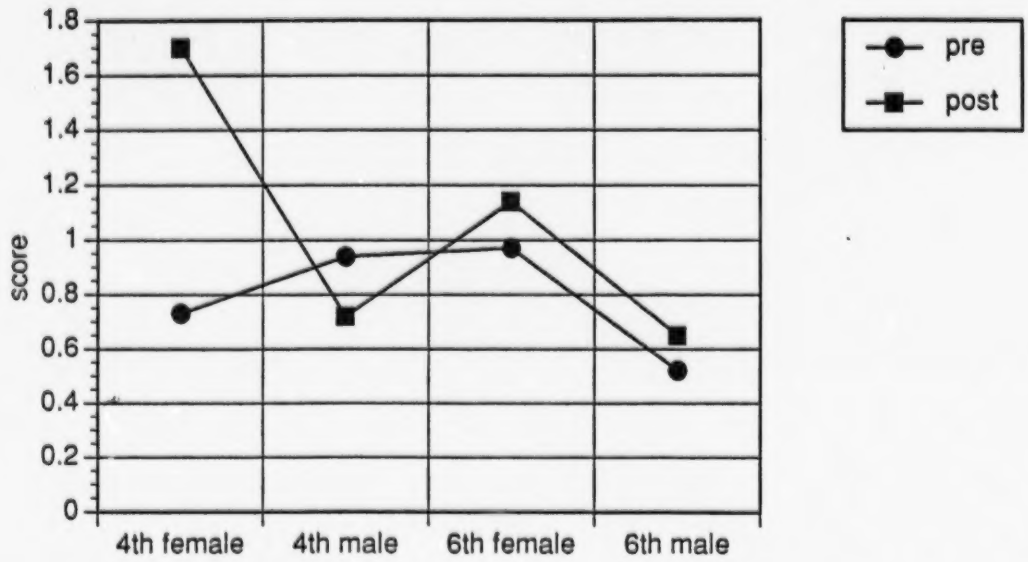
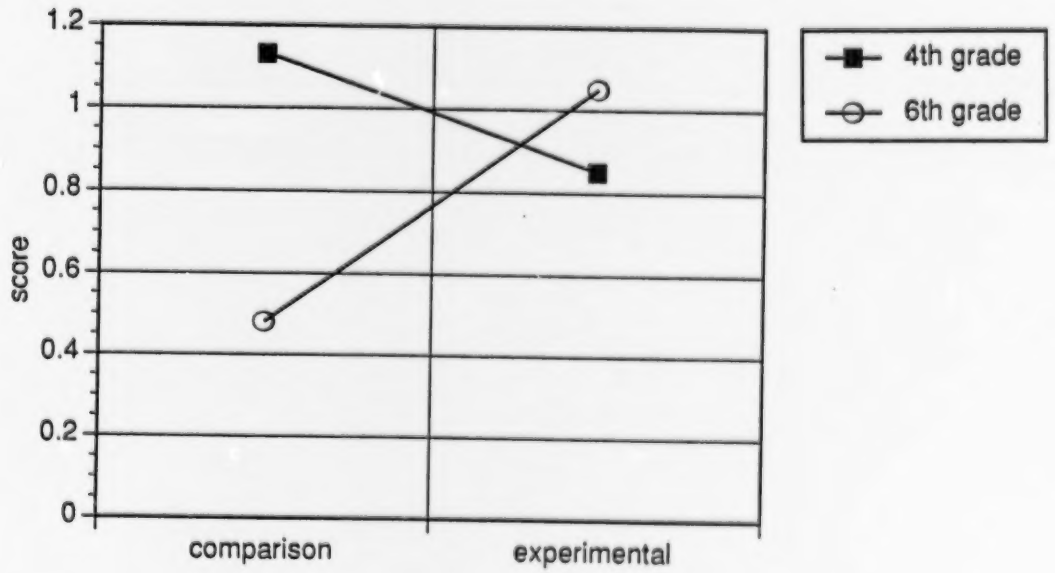


Figure 1. Test time x grade x gender for *warrants* scores.



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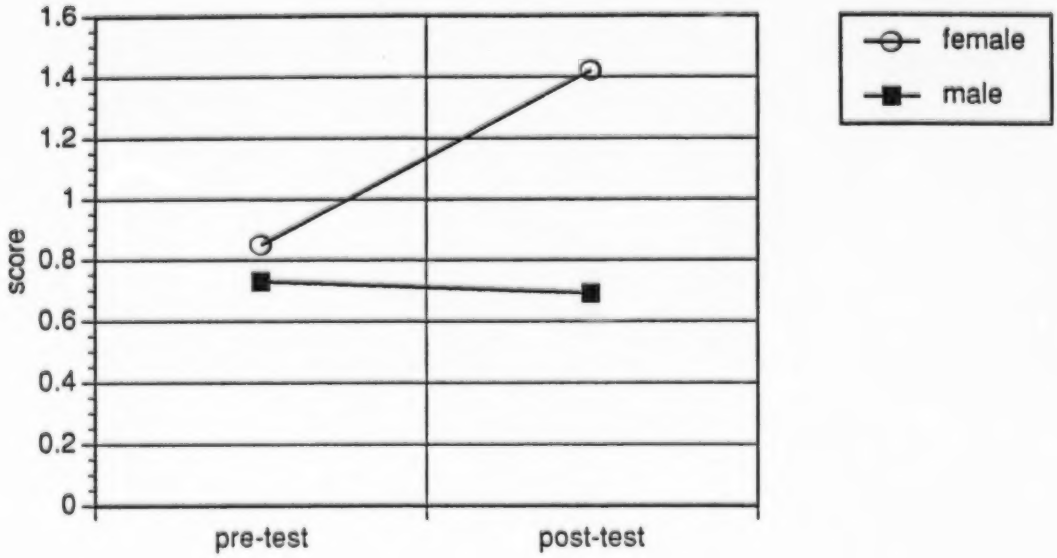

Figure 3. Test time x gender for *warrants* scores.